

Hybrid Propulsion for Upper-Stage Boosters, Phase I

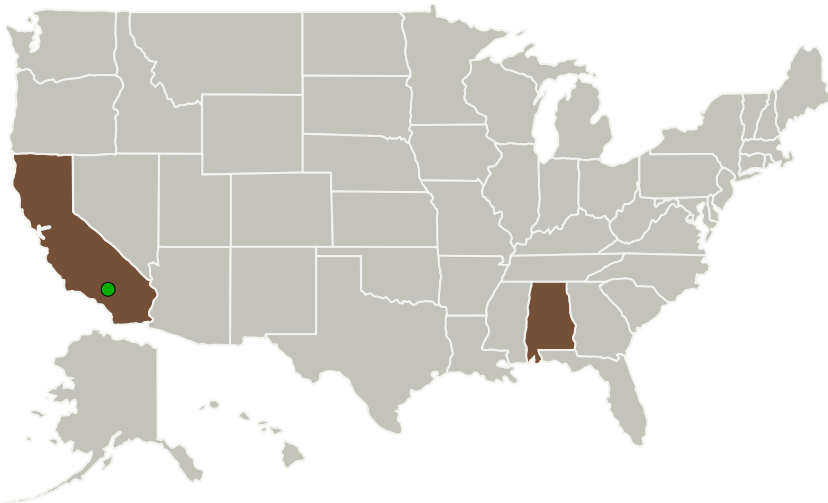
Completed Technology Project (2012 - 2013)



Project Introduction

The objective of the proposed research and development effort is to demonstrate the feasibility of an innovative approach to high-performance hybrid propulsion for upper-stages. The missions for these propulsion systems include launching small- and nano-satellites and conducting hypersonic flight test operations. The focus of the research effort will be on achieving high specific impulse by means of an innovative approach to nozzle design. The technology will be experimentally demonstrated in a series of hot-fire tests during the proposed research program.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Exquadrum, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Adelanto, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
University of Alabama in Huntsville(UAH)	Supporting Organization	Academia	Huntsville, Alabama

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Primary U.S. Work Locations

Alabama

California

Project Transitions



February 2012: Project Start



February 2013: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140338>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Exquadrum, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Kevin E Mahaffy

Co-Investigator:

Kevin Mahaffy

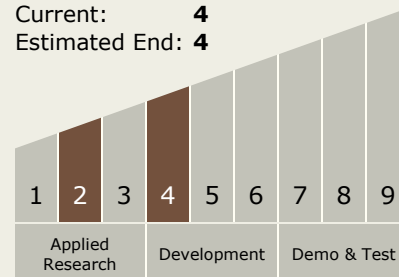
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Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.5 Hybrids

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System